In the Claims

Applicants have submitted a new complete claim set.

Please cancel claims 1-709.

Please add pending claims 710-908 as noted below.

1-709. (Canceled)

710. (New) A nanowire, comprising:

a first segment of a first material; and

a second segment of a second material joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm; and

wherein said nanowire is selected from a population of nanowires having a substantially monodisperse distribution of diameters.

711. (New) A nanowire, comprising:

a first segment of a first material; and

a second segment of a second material joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm; and

wherein said nanowire is selected from a population of nanowires having a substantially monodisperse distribution of lengths.

712. (New) A nanowire, comprising:

a first segment of a first material; and

a second segment of a second material joined to said first segment;

said nanowire displaying characteristics selected from the group consisting essentially of electronic properties, optical properties, physical properties, magnetic properties and chemical properties that are modified relative to the bulk characteristics of said first and second materials by quantum confinement effects.

713. (New) A nanowire, comprising:

a first segment of a first material; and

a second segment of a second material joined to said first segment;

said nanowire having at least one electronic property that varies as a function of diameter of said nanowire.

714. (New) A nanowire as recited in claim 713, wherein said at least one electronic property comprises band-gap energy.

715. (New) A nanowire, comprising:

a first segment of a substantially crystalline material; and

a second segment of a substantially crystalline material joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

716. (New) A nanowire as recited in claim 715, wherein each of said first and said second segments comprises a doped semiconductor material.

717. (New) A nanowire as recited in claim 716, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

718. (New) A nanowire as recited in claim 715, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

719. (New) A nanowire, comprising:

a first segment of a substantially crystalline material; and

a second segment of a compositionally different material joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

720. (New) A nanowire as recited in claim 719, wherein said second segment comprises a substantially crystalline material.

721. (New) A nanowire, comprising:

a first segment of semiconductor material; and

a second segment of semiconductor material joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

722. (New) A nanowire as recited in claim 721, wherein each of said first and said second segments comprise a doped semiconductor material.

723. (New) A nanowire as recited in claim 722, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

724. (New) A nanowire as recited in claim 721, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

725. (New) A nanowire, comprising:

a first segment of doped semiconductor material; and

a second segment of doped semiconductor material joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

726. (New) A nanowire as recited in claim 725, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

727. (New) A nanowire as recited in claim 725, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

728. (New) A nanowire, comprising:

a first segment of a substantially crystalline material; and

a second segment of a compositionally different material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm; and

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

729. (New) A nanowire as recited in claim 728, wherein said second segment comprises a substantially crystalline material.

730. (New) A nanowire, comprising:

a first segment of a substantially crystalline material; and

a second segment of a substantially crystalline material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm; and

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

731. (New) A nanowire as recited in claim 730, wherein each of said first and said second segments comprises a semiconductor material.

732. (New) A nanowire as recited in claim 730, wherein each of said first and said second segments comprises a doped semiconductor material.

733. (New) A nanowire as recited in claim 732, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

734. (New) A nanowire as recited in claim 730, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

735. (New) A nanowire, comprising:

a first segment of semiconductor material; and

a second segment of semiconductor material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm; and

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

736. (New) A nanowire as recited in claim 735, wherein each of said first and said second segments comprises a doped semiconductor material.

737. (New) A nanowire as recited in claim 736, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

738. (New) A nanowire as recited in claim 735, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

739. (New) A nanowire, comprising:

a first segment of doped semiconductor material; and

a second segment of doped semiconductor material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm;

and wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

740. (New) A nanowire as recited in claim 739, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

741. (New) A nanowire as recited in claim 739, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

742. (New) A nanowire, comprising:

a first segment of a substantially crystalline material; and

a second segment of a compositionally different material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm;

wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of said first segment at the center of said first segment; and

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

743. (New) A nanowire as recited in claim 742, wherein said second segment comprises a substantially crystalline material.

744. (New) A nanowire, comprising:

a first segment of a substantially crystalline material; and

a second segment of a substantially crystalline material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm;

wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of said first segment at the center of said first segment;

wherein at least one of said segments has a diameter of less than approximately 200 nm; and

wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 10% over the length of said segment.

745. (New) A nanowire as recited in claim 744, wherein each of said first and said second segments comprises a semiconductor material.

746. (New) A nanowire as recited in claim 744, wherein each of said first and said second segments comprises a doped semiconductor material.

747. (New) A nanowire as recited in claim 746, wherein said doped semiconductor material is selected from the group consisting essentially of a group II-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

748. (New) A nanowire as recited in claim 744, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

749. (New) A nanowire, comprising:

a first segment of semiconductor material; and

a second segment of semiconductor material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment

over a distance ranging from approximately one atomic layer to approximately 20 nm;

wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of said first segment at the center of said first segment;

wherein at least one of said segments has a diameter of less than approximately 200 nm; and

wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 10% over the length of said segment.

750. (New) A nanowire as recited in claim 749, wherein each of said first and said second segments comprises a doped semiconductor material.

751. (New) A nanowire as recited in claim 750, wherein said doped semiconductor material is selected from the group consisting essentially of a group III-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

752. (New) A nanowire as recited in claim 749, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

753. (New) A nanowire, comprising:

a first segment of doped semiconductor material;

and a second segment of doped semiconductor material joined to said first segment;

wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm;

wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of the first segment at the center of said first segment;

wherein at least one of said segments has a diameter of less than approximately 200 nm; and

wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 10% over the length of said segment.

754. (New) A nanowire as recited in claim 753, wherein said doped semiconductor material is selected from the group consisting essentially of a group II-V semiconductor, a group II-VI semiconductor, a group II-IV semiconductor, and tertiaries and quaternaries thereof.

755. (New) A nanowire as recited in claim 753, wherein each of said first and second segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

756. (New) A nanowire as recited in claims 710, 711, 712 or 713, wherein at least one of said materials comprises a substantially crystalline material.

757. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 721, 725, 730, 735, 739, 744, 749 or 753, wherein said first and second materials are compositionally different materials.

758. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 744, 749 or 753, wherein at least one of said segments comprises a substantially monocrystalline material.

759. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721 or 725, wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 100 nm.

760. (New) A nanowire as recited in claim 759, wherein said transition occurs over a region that is substantially defect free.

761. (New) A nanowire as recited in claim 759, wherein said transition occurs over a region that is substantially crystalline.

762. (New) A nanowire as recited in claim 759, wherein said transition occurs over a region that is substantially monocrystalline.

763. (New) A nanowire as recited in claim 759, wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of said first segment at the center of said first segment.

764. (New) A nanowire as recited in claims 710, 711, 712, 713, 714, 715, 719, 721 or 725, wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm.

765. (New) A nanowire as recited in claim 764, wherein said transition occurs over a region that is substantially defect free.

766. (New) A nanowire as recited in claim 764, wherein said transition occurs over a region that is substantially crystalline.

767. (New) A nanowire as recited in claim 764, wherein said transition occurs over a region that is substantially monocrystalline.

768. (New) A nanowire as recited in claim 764, wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of said first segment at the center of said first segment.

769. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 728, 730, 742 or 744, wherein at least one of said segments comprises a semiconductor material.

770. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 728, 730, 735, 742, 744 or 749, wherein at least one of said segments comprises a doped semiconductor material.

771. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 729, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein at least one of said segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

772. (New) A nanowire as recited in claims 710, 711, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 479 or 753, wherein said at least one of said segments having a diameter of less than approximately 200 nm has a diameter ranging from approximately 5 nm to approximately 50 nm.

773. (New) A nanowire as recited in claims 710, 711, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 50% over the length of said segment.

774. (New) A nanowire as recited in claims 710, 711, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 10% over the length of said segment.

775. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said second segment is longitudinally adjacent said first segment.

776. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said second segment is coaxially adjacent said first segment.

777. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said first segment comprises a substantially monocrystalline material.

778. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said second segment comprises a substantially monocrystalline material.

779. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said first and second segments form a p-n junction.

780. (New) A nanowire as recited in claim 779, wherein said nanowire comprises a semiconductor device.

781. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said first and second segments form a p-i junction.

782. (New) A nanowire as recited in claim 781, wherein said nanowire comprises a semiconductor device.

783. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said first and second segments form a i-n junction.

784. (New) A nanowire as recited in claim 783, wherein said nanowire comprises a semiconductor device.

785. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, further comprising an electrode electrically coupled to at least one of said segments.

786. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein at least one of said segments comprises a material selected from the group of elements consisting essentially of group II, group III, group IV, group V, group VI elements, and tertiaries and quaternaries thereof.

787. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein at least one of said segments is embedded in a polymer matrix.

788. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein at least a portion of at least one of said segments is covered by a sheath.

789. (New) A nanowire as recited in claim 788, wherein said sheath comprises an amorphous material.

790. (New) A nanowire as recited in claim 788, wherein said sheath comprises a substantially crystalline material.

791. (New) A nanowire as recited in claim 790, wherein said substantially crystalline material is substantially monocrystalline.

792. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753: wherein said nanowire is a functional component of a device selected from the group of devices consisting essentially of quantum dot devices, photonic devices, nanoelectromechanical sensors, field-effect transistors, resonant

tunneling diodes, single electron transistors, magnetic sensors, light emitting devices, optical detectors, optical waveguides, and lasers.

793. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, wherein said nanowire is an element of an array of nanowires.

794. (New) A nanowire as recited in claim 793, wherein said array comprises an oriented array.

795. (New) A nanowire as recited in claim 793, wherein each of said nanowires in said array is oriented at an angle substantially normal to a substrate.

796. (New) A nanowire as recited in claim 793, wherein each of said nanowires in said array is oriented at an angle that is not normal to a substrate.

797. (New) A nanowire as recited in claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753, electrically coupled to a second nanowire wherein a junction is formed.

798. (New) A nanowire as recited in claim 797, wherein said nanowire is in ohmic contact with said second nanowire.

799. (New) A nanowire as recited in claim 797, wherein said nanowire is inductively coupled to said second nanowire.

800. (New) A nanowire as recited in claim 797, wherein said nanowire forms a tunneling junction with said second nanowire.

801. (New) A nanowire as recited in claim 797, wherein said junction has a substantially linear voltage-current relationship.

802. (New) A nanowire as recited in claim 797, wherein said junction has a substantially non-linear voltage-current relationship.

803. (New) A nanowire as recited in claim 797, wherein said junction has a substantially step function voltage-current relationship.

804. (New) A nanowire collection, comprising: a plurality of a nanowires as recited in any of claims 710, 711, 712, 713, 715, 719, 721, 725, 728, 730, 735, 739, 742, 744, 749 or 753.

805. (New) A nanowire collection as recited in claim 804, wherein said collection comprises greater than approximately 100 nanowires.

806. (New) A nanowire collection as recited in claim 804, wherein said collection comprises greater than approximately 1000 nanowires.

807. (New) A nanowire collection as recited in claim 804, wherein greater than 80% of the members of said collection comprise substantially the same heterostructure.

808. (New) A nanowire collection as recited in claim 804, wherein substantially all of the members of said collection exhibit substantially the same heterostructure.

809. (New) A nanowire collection as recited in claim 804, wherein the members of said collection comprise at least two different species of nanowire.

810. (New) A nanowire collection as recited in claim 804, wherein the members of said collection comprise at least ten different species of nanowire.

811. (New) A nanowire collection as recited in claim 804, wherein said collection is suspended in a fluid.

812. (New) A nanowire collection as recited in claim 804, wherein said collection is suspended by a material selected from the group consisting essentially of a liquid and a gas.

813. (New) A nanowire collection as recited in claim 804, wherein said collection is suspended or embedded in a matrix.

814. (New) A nanowire collection as recited in claim 804, wherein one or more members of said collection is electrically coupled to one or more other members of said collection.

815. (New) A nanowire collection as recited in claim 814, wherein one or more members of said collection is in ohmic contact with one or more other members of said collection.

816. (New) A nanowire collection as recited in claim 814, wherein one or more members of said collection is inductively coupled with one or more other members of said collection.

817. (New) A nanowire collection as recited in claim 814, wherein one or more members of said collection forms a tunneling junction with one or more other members of said collection.

818. (New) A nanowire collection as recited in claim 814, wherein said electric coupling has a substantially non-linear voltage-current relationship.

819. (New) A nanowire collection as recited in claim 814, wherein said electric coupling has a substantially linear voltage-current relationship.

820. (New) A nanowire collection as recited in claim 814, wherein said electric coupling has a substantially step function voltage-current relationship.

821. (New) A nanowire collection as recited in claim 804, wherein said collection has a substantially monodisperse distribution of nanowire diameters.

822. (New) A collection of nanowires as recited in claim 804, wherein said collection has a substantially monodisperse distribution of nanowire lengths.

823. (New) A nanowire, comprising:

a first segment of a first material;

a second segment of a second material joined to said first segment; and

a third segment of a third material joined to at least one of said first and second segments;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm;

wherein at least two of said materials comprise compositionally different materials; and

wherein at least two of said segments are adjacent.

824. (New) A nanowire as recited in claim 823, wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 10% over the length of said segment.

825. (New) A nanowire as recited in claim 823, wherein said nanowire transitions from at least one of said segments to an adjacent segment over a distance ranging from approximately one atomic layer to approximately 20 nm.

826. (New) A nanowire as recited in claim 825, wherein said transition begins at a point moving from said at least one of said segments toward said adjacent segment where the composition of said at least one of said segments has decreased to approximately 99% of the composition of that segment at its center.

827. (New) A nanowire as recited in claim 823, wherein at least two of said segments are longitudinally adjacent.

828. (New) A nanowire as recited in claim 823: wherein said second segment is longitudinally adjacent said first segment; and wherein said third segment is longitudinally adjacent said second segment.

829. (New) A nanowire as recited in claim 823, wherein at least two of said segments are coaxially adjacent.

830. (New) A nanowire as recited in claim 823, wherein at least one of said materials comprises a substantially crystalline material.

831. (New) A nanowire as recited in claim 823, wherein said substantially crystalline material is substantially monocrystalline.

832. (New) A nanowire as recited in claim 823, wherein at least one of said segments comprises a semiconductor material.

833. (New) A nanowire as recited in claim 823, wherein at least one of said segments comprises a doped semiconductor material.

834. (New) A nanowire as recited in claim 823, wherein at least one of said segments exhibits the electrical characteristics of a homogeneously doped semiconductor.

835. (New) A nanowire as recited in claim 823, wherein said at least one of said segments having a diameter of less than approximately 200 nm has a diameter ranging from approximately 5 nm to approximately 50 nm.

836. (New) A nanowire as recited in claim 823, wherein at least two of said segments form a p-n junction.

837. (New) A nanowire as recited in claim 823, wherein at least two of said segments form a p-i junction.

838. (New) A nanowire as recited in claim 823, wherein at least two of said segments form a i-n junction.

839. (New) A nanowire as recited in claim 823, wherein said segments form p-n-p junctions.

840. (New) A nanowire as recited in claim 823, wherein said segments a n-p-n junctions.

841. (New) A nanowire as recited in claim 823, wherein said segments form p-i-n junctions.

842. (New) A nanowire as recited in claim 823, wherein said segments form p-i-p junctions.

843. (New) A nanowire as recited in claims 836, 837, 838, 839, 840, 841 or 842, wherein said nanowire comprises a semiconductor device.

844. (New) A nanowire as recited in claim 823, further comprising an electrode electrically coupled to at least one of said segments.

845. (New) A nanowire as recited in claim 823, wherein at least one of said segments comprises a material selected from the group of elements consisting essentially of group II, group III, group IV, group V, and group VI elements, and tertiaries and quaternaries thereof.

846. (New) A nanowire as recited in claim 823, wherein at least one of said segments is embedded in a polymer matrix.

847. (New) A nanowire as recited in claim 823, wherein at least a portion of at least one of said segments is covered by a sheath.

848. (New) A nanowire as recited in claim 847, wherein said sheath comprises an amorphous material.

849. (New) A nanowire as recited in claim 847, wherein said sheath comprises a substantially crystalline material.

850. (New) A nanowire as recited in claim 140, wherein said substantially crystalline material is substantially monocrystalline.

851. (New) A nanowire as recited in claim 823: wherein said nanowire is a functional component of a device selected from the group of devices consisting essentially of quantum dot devices, photonic devices, nanoelectromechanical sensors, field-effect transistors, resonant tunneling diodes, single electron transistors, magnetic sensors, light emitting devices, optical detectors, optical waveguides, and lasers.

852. (New) A nanowire as recited in claim 823, wherein said nanowire is an element of an array of nanowires.

853. (New) A method of fabricating a nanowire, comprising:

dissolving a first gas reactant in a catalytic liquid followed by growth of a first segment; and

dissolving a second gas reactant in said catalytic liquid followed by growth of a second compositionally different segment joined to said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

854. (New) A method as recited in claim 853:

wherein a compositionally dissimilar liquid alloy is formed from each said gas reactant and said catalytic liquid; and

wherein each said segment forms upon saturation of said liquid alloy with a species of said corresponding gas reactant.

855. (New) A method as recited in claim 853: wherein said first and second gas reactants comprise vapors generated by laser ablation of a first and second growth species respectively.

856. (New) A method of claim 855, wherein said first and second gas reactants further comprise a carrier gas.

857. (New) A method as recited in claim 853:

wherein said second gas reactant comprises a vapor generated by laser ablation of a growth species; and

wherein said second segment comprises a combination of said species in said first and second gas reactants.

858. (New) A method as recited in claim 853, wherein said catalytic liquid is formed from a preformed metal colloid.

859. (New) A method as recited in claim 858, wherein said metal colloid is part of a population of metal colloids with a substantially monodisperse distribution of diameters.

860. (New) A method of fabricating a nanowire, comprising:

dissolving a gas reactant in a catalytic liquid followed by growth of a first segment; and

coating said first segment with a compositionally different second material and forming a second segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

861. (New) A method as recited in claim 860:

wherein a liquid alloy is formed from said gas reactant and said catalytic liquid; and

wherein said first segment forms upon saturation of said liquid alloy with a species of said gas reactant.

862. (New) A method as recited in 860, wherein said catalytic liquid is formed from a preformed metal colloid.

863. (New) A method as recited in 862, wherein said metal colloid is part of a population of metal colloids with a substantially monodisperse distribution of diameters.

864. (New) A method of fabricating a nanowire, comprising:

forming a first segment by dissolving a first gas reactant in a catalytic liquid followed by growth of a first material;

forming a second segment joined to said first segment by dissolving a second gas reactant in said catalytic liquid followed by growth of a second material joined to said first material;

wherein each said segment forms upon saturation of said liquid alloy with a species of said corresponding gas reactant; and

coating at least a portion of at least one of said segments with a third material to form a third segment;

wherein at least two of said materials are compositionally different; and

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

865. (New) A method of fabricating a nanowire, comprising:

dissolving a first gas reactant in a catalytic liquid followed by growth of a first segment of material;

dissolving a second gas reactant in said catalytic liquid followed by growth of a second segment of material joined to said first segment; and

dissolving a third gas reactant in said catalytic liquid followed by growth of a third segment of material joined to said second segment;

wherein, said first, second and third segments are longitudinally adjacent;

wherein said second segment is positioned between said first and third segments;

wherein at least two of said segments comprise compositionally different materials; and

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

866. (New) A method as recited in claim 865:

wherein at least two of said gas reactants are the same; and

wherein at least two of said segments comprise the same material.

867. (New) A method as recited in claim 865:

wherein a liquid alloy is formed from each said gas reactant and said catalytic liquid; and

wherein each said nanowire segment forms upon saturation of said liquid alloy with a species of said corresponding gas reactant.

868. (New) A method as recited in claim 865:

wherein at least one of said gas reactants comprises a vapor generated by laser ablation of a growth species;

and wherein at least one of said nanowire segments comprises a combination of species in said laser generated vapor and at least one other gas reactant.

869. (New) A method of fabricating a nanowire heterostructure, comprising:

dissolving a first gas reactant in a catalytic liquid followed by growth of a first segment of a first material; and

dissolving a second gas reactant in said catalytic liquid followed by growth of a second segment of compositionally different second material longitudinally adjacent to said first material;

wherein said second gas reactant comprises a vapor generated by laser ablation of a growth species;

wherein a compositionally dissimilar liquid alloy is formed from each said gas

reactant and said catalytic liquid;

wherein each said segment forms upon saturation of said liquid alloy with a species of said corresponding gas reactant;

wherein said second material comprises a combination of said species in said first and second gas reactants; and

wherein at lest one of said segments has a substantially uniform diameter of less than approximately 200 nm.

870. (New) A method of fabricating a nanowire, comprising:

dissolving a first gas reactant in a catalytic liquid followed by growth of a first segment of a first material;

sequentially laser ablating a growth species in the presence of said first gas reactant thereby forming a second gas reactant;

dissolving said second gas reactant in said catalytic liquid followed by growth of a second segment of a compositionally different second material longitudinally adjacent to said first material;

wherein said second material comprises a combination of species in said first and second gas reactants;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

871. (New) A method as recited in claim 870:

wherein a compositionally dissimilar liquid alloy is formed from each said gas reactant and said catalytic liquid; and

wherein each said segment forms upon saturation of said liquid alloy with a species of said corresponding gas reactant.

872. (New) A method of fabricating a doped semiconductor superlattice nanowire, comprising:

introducing a gas reactant into a reaction chamber of a furnace containing a substrate coated with a reactant metal;

heating said reaction chamber to a temperature at which said metal on said substrate liquefies into at least one droplet;

dissolving said gas reactant into said liquid droplet until saturation where nucleation and growth of a first segment; and

dissolving a dopant and said gas reactant into said liquid droplet until saturation wherein nucleation and growth of a doped second segment occurs on said first segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

873. (New) A method as recited in claim 871, wherein said substrate comprises an element selected from the group of elements consisting essentially of group III and group IV elements.

874. (New) A method as recited in claim 871, wherein said metal comprises gold.

875. (New) A method as recited in claim 874, wherein said gold comprises colloidal gold.

876. (New) A method as recited in claim 871:

wherein said substrate comprises silicon; and

wherein said metal comprises gold.

877. (New) A method as recited in claim 871, wherein said furnace comprises a quartz furnace reaction tube.

878. (New) A method as recited in claim 871, wherein said gas reactant comprises H_2.

879. (New) A method of fabricating an Si/SiGe superlattice nanowire heterostructure, comprising:

depositing Au on a substrate;

placing said substrate inside a quartz furnace reaction tube;

introducing a gas reactant mixture comprising H_2 into said reaction tube;

heating said reaction tube to a temperature at which said Au liquefies into at least one nanosized droplet of an Au--Si alloy; and

dissolving said gas reactant into said liquid droplet until saturation where nucleation and growth of a Si segment occurs;

during said Si growth process, generating a Ge vapor through ablation of a Ge target with a laser;

depositing both Ge and Si species into said Au--Si alloy droplets until saturation wherein nucleation and growth of a SiGe segment occurs on said Si segment;

wherein at least one of said segments has a substantially uniform diameter of less than approximately 200 nm.

880. (New) A method as recited in claim 879, further comprising:

pulsing said laser on and off;

wherein a Si/SiGe superlattice is formed in a block-by-block fashion.

881. (New) A method as recited in claim 879, wherein said substrate comprises an element selected from the group of elements consisting essentially of group III and group IV elements.

882. (New) A method as recited in claim 879, wherein said gold comprises colloidal gold.

883. (New) A method as recited in claim 879, wherein said substrate comprises silicon.

884. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein the diameter of said at least one of said segments having a diameter of less than approximately 200 nm does not vary by more than approximately 10% over the length of said segment.

885. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein said nanowire transitions from said first segment to said second segment over a distance ranging from approximately one atomic layer to approximately 20 nm.

886. (New) A method as recited in claim 885, wherein transition from said first segment to said second segment begins at a point toward said second segment where the composition of said first segment has decreased to approximately 99% of the composition of said first segment at the center of said first segment.

887. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 782 or 879, wherein at least one of said segments comprises a substantially crystalline material.

888. (New) A method as recited in claim 887, wherein said substantially crystalline material is substantially monocrystalline.

889. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein at least one of said segments comprises a semiconductor material.

890. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising doping at least one of said segments.

897. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein said at least one of said segments having a diameter of less than approximately 200 nm has a diameter ranging from approximately 5 nm to approximately 50 nm.

892. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein said second segment is longitudinally adjacent said first segment.

893. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein said second segment is coaxially adjacent said first segment.

894. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising doping said first and second segments to form a p-n junction.

895. (New) A method as recited in claim 894, wherein said nanowire comprises a semiconductor device.

896. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising doping a said one of said segments to form a p-i junction.

897. (New) A method as recited in claim 896, wherein said nanowire comprises a semiconductor device.

898. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising doping a said one of said segments to form a i-n junction.

899. (New) A method as recited in claim 898, wherein said nanowire comprises a semiconductor device.

900. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising electrically coupling an electrode to at least one of said segments.

901. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein at least one of said segments comprises a material selected from the group of elements consisting essentially of group II, group III, group IV, group V, and group VI elements, and tertiaries and quaternaries thereof.

902. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising embedding at least one of said segments in a polymer matrix.

903. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, further comprising depositing a sheath over a portion of at least one of said segments.

904. (New) A method as recited in claim 903, wherein said sheath comprises an amorphous material.

905. (New) A method as recited in claim 903, wherein said sheath comprises a substantially crystalline material.

906. (New) A method as recited in claim 905, wherein said substantially crystalline material is substantially monocrystalline.

907. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879: wherein said nanowire is a functional component of a device selected from the group of devices consisting essentially of quantum dot devices, photonic devices, nanoelectromechanical sensors, field-effect transistors, resonant tunneling diodes, single electron transistors, magnetic sensors, light emitting devices, optical detectors, optical waveguides, and lasers.

908. (New) A method as recited in claims 853, 860, 864, 865, 869, 870, 872 or 879, wherein said nanowire is an element of an array of nanowires.